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SURFACE SPOTS ON PLATE OF ALUMINIUM ALLOY

(Devoted to the Life Anniversary of Professors Z. Jonšta and P. Koštial)

POVRCHOVÉ SKVRNKY NA PLECHU Z HLINÍKOVÉ SLITINY

(Věnovaný životnímu jubileu Prof. Jonšty a Prof. Koštiala)

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Abstract

The surface spots on aluminium alloy plates are caused by microcrack network in surface layers. The standard plates have no spotted surfaces. The microcracks on the surface of defected plates have obviously the metallurgical origin and have no relation to the quality of tools (rolls).

Keywords: aluminium alloy plate, surface spots, microcrack network

1. Introduction

The surface of the samples has been analyzed using the scanning electron microscope JEOL JSM – 6490 and by interconnected analyser INCA X – ACT.

The photographs from the surface of samples No. 1 to 3 are shown in the Figs. 1 to 3. As shown at the samples 1 – 2, in place of the surface spots we see the microcrack network, which represent the not sufficient deformability of surface layers. On the third sample (reference specimen) it is only the surface roughness which is evident in the Fig. 3. The surface is relatively smooth and some microcracks evident on the surface are only of very small dimensions and are not disturbing the integrity of surface.

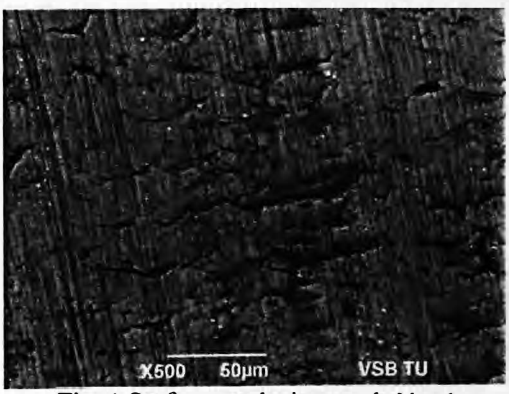


Fig. 1 Surface cracks in sample No. 1

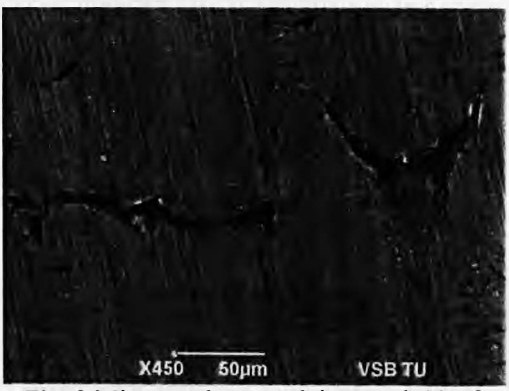


Fig. 2 Microcrack network in sample No. 2

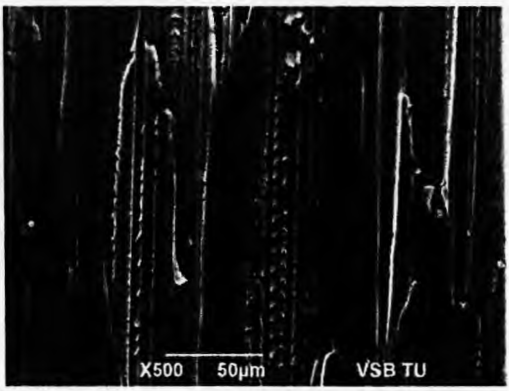


Fig. 3 Smooth surface of sample No.3

The surface chemical analysis is shown in the Figs. 4 and 5 (for the samples 1 and 2) and in the Fig. 6 for the reference sample 3. On the basis of the detailed chemical analysis it is not possible to decide about the spot origin.

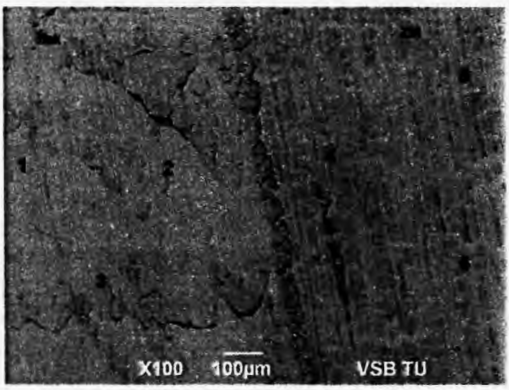
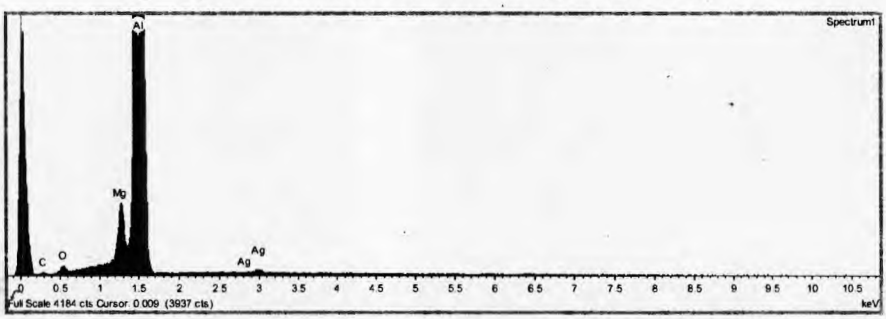


Fig. 4 Spot where the local chemical analysis hase been taken



	Weight %			
Name	O	Mg	Al	Ag
Spectrum1	3.332	3.148	92.532	0.987
Spectrum2	3.064	3.101	93.110	0.725
Spectrum3	3.672	3.120	91.660	1.547
Spectrum4	6.037	3.177	89.244	1.541
Spectrum5	6.885	3.115	88.552	1.448
Spectrum6	5.533	3.080	89.844	1.542

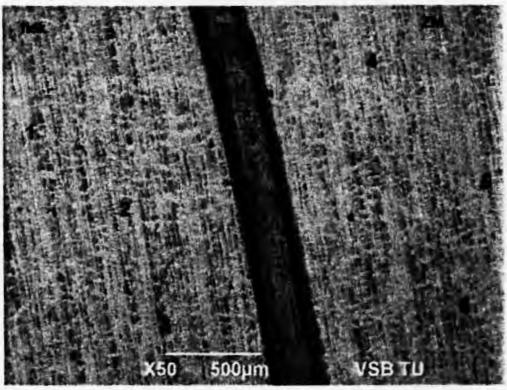
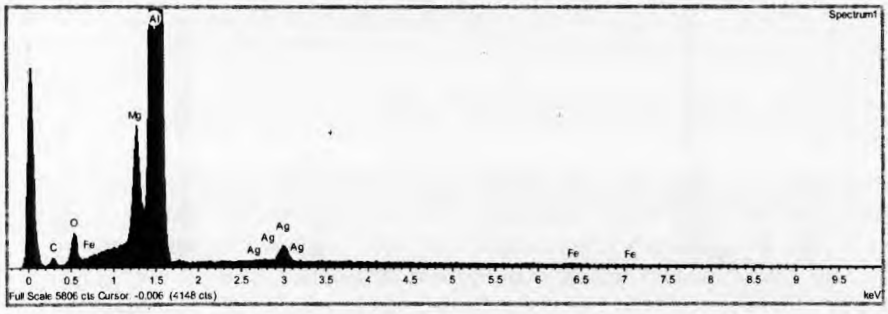


Fig. 5 Spot where the chemical analysis has been taken



	Weight %				
Name	O	Mg	Al	Fe	Ag
Spectrum1	7.035	3.269	87.005	0.239	2.452
Spectrum2	6.844	3.239	87.200	0.250	2.468
Spectrum3	6.975	3.183	87.089	0.234	2.520
Spectrum4	5.650	3.210	88.461		2.679
Spectrum5	6.259	3.189	88.093		2.458
Spectrum6	6.007	3.223	88.698		2.071

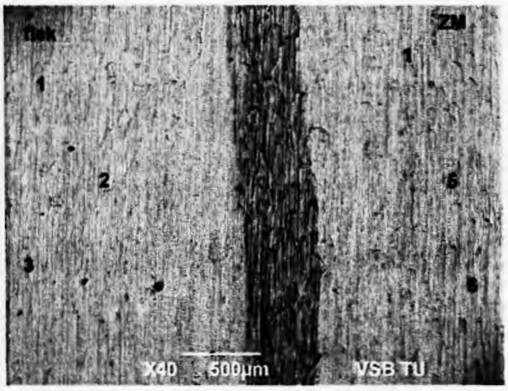
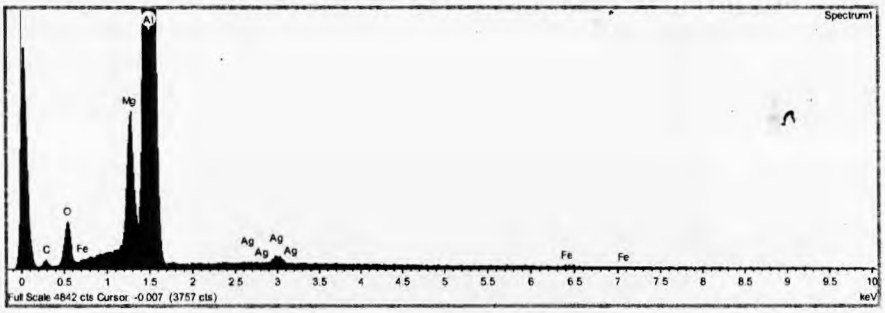


Fig. 6 Spot where the chemical analysis has been taken



	Weight %						
Name	O	Mg	Al	Si	Mn	Fe	Ag
Spectrum1	11.201	4.620	82.617			0.273	1.289
Spectrum2	9.574	4.091	84.491			0.263	1.581
Spectrum3	9.304	4.057	84.568			0.376	1.695
Spectrum4	9.701	4.175	84.162			0.309	1.653
Spectrum5	10.116	4.106	84.030			0.213	1.536
Spectrum6	10.169	4.082	83.713			0.192	1.843
Inclusion 1	11.948	3.838	76.464	0.360	0.431	5.043	1.916

2. Conclusion

The surface spots visible on the samples 1 and 2, taken from the apparently defective plate, are caused by the occurrence of microcrack network in the surface area. Such microcrack network is possibly of metallurgical character and has no correspondence to the surface of tools (rolls). In further dealing with the problem it would be necessary to take in the account the origin material and the metallurgical technology of its preparation. The surface chemical analysis has not brought us the required result. In case of industrial atmosphere around the aluminium plate with such spots there is the danger of the initiation and further crack growth from such spots /1/.

References

[1]. V. Číhal: Korozivzdorné oceli a slitiny, Academia Praha, 1999

Reviewer: Doc. Ing. Stanislav Lasek, Ph.D., VŠB – TU Ostrava